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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/553,199	10/13/2005	Koji Tokuda	279096US3PCT	1253

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OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, L.L.P.
1940 DUKE STREET
ALEXANDRIA, VA 22314

EXAMINER
YANG, JIE

ART UNIT	PAPER NUMBER
1733	

NOTIFICATION DATE	DELIVERY MODE
10/07/2010	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@oblon.com
oblonpat@oblon.com
jgardner@oblon.com

Office Action Summary	Application No.	Applicant(s)	
	10/553,199	TOKUDA ET AL.	
	Examiner	Art Unit	
	JIE YANG	1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 July 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8,15 and 16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *6* is/are allowed.

6)☒ Claim(s) *1-5,7,8,15 and 16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 7/30/2010 has been entered.

Status of the Claims

Claim 1-8, 15, and 16 remain for examination. Claims 1, 2, and 16 are independent claims.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-5, 7, 8, 15, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kamikawa et al (US 6,413,471 B1, thereafter US'471).

Regarding claims 1 and 2, US'471 teaches a process for producing reduced iron in a rotary hearth furnace (Abstract, col.1, lines 6-12 of US'471). US'471 teaches mixing an iron ore powder, a coal powder, a fluxstone (limestone) powder, and a binder to form reduced iron compacts, which reads on the feedstock containing a carbonaceous reductant and an iron oxide-containing material as recited in the instant claims. US'471 teaches feeding process, high temperature atmosphere (in which heating/reducing, melting steps are performed), and discharge portion (in which cooling, and discharging steps are performed) (Col.1, lines 13-23, and Col.2, line 47 to col.3, line 3 of US'471), which reads on the claimed process steps as recited in the instant claims. US'471 teaches air flow controlling partitions (Col.3, line 38 to Col.4. line 33 of US'471), which reads on flow rate-controlling partitions as recited in the instant claims. Regarding the feature of "…having flow rate-controlling partitions arranged therein for controlling the flow of furnace gas" in claims 1 and 2, US'471 teaches air flow controlling partitions (Col.3, line 38 to Col.4. line 33 of US'471), and US'471 teaches: "…partition plates as the supply portion partitioning means may be provided in the high temperature atmosphere space portion and the gas passage space portion. Thus, air flow from the compact supply portion and the

gas passage space portion to the high temperature atmosphere space portion and the compact discharge portion can be suppressed to diminish the influence on the high temperature atmosphere or on the regulation of pressure inside the furnace. Moreover, reoxidation of reduced iron can be prevented." (Col.3, lines 38-55 of US'471), which reads on the partitions arrangement and their air-flow-control function as recited in the instant claims. Regarding the limitation of "oxidizing gas is prevented from flowing from the discharging step to the cooling step using the flow rate-controlling partitions" in the instant claim 1, US'471 teaches: "…high temperature atmosphere space portion partitioning means may be provided as partitions at least between a heating zone, a CO ratio control zone, and a reducing atmosphere zone in the high temperature atmosphere space portion. Thus, air flow in a side portion of the frame between the respective zones can be suppressed, and the CO ratio in each of the zones can be controlled appropriately. Consequently, reduced iron having a high degree of metallization can be produced." (Col.4, lines 49-59 of US'471), because air flow is a kind of oxidizing gas, therefore, suppressing air flow in the process of US'471 reads on the preventing oxidizing gas as recited in the instant claim 1.

Still regarding claims 1 and 2, and claim 15, US'471 does not specify allowing the flow the furnace gas in the direction of the movement of the hearth (claim 1), maintaining higher pressure in melting step (claim 2); and maintaining higher pressure in the cooling step than the feeding step (claim 15). However, US'471 teaches using partition plates to regulate the pressure inside the furnace in order to increase the operation efficiency (Col.8, lines 24-35 of US'471) and US'471 teaches: "In the present embodiment, however, the central partition plates 53a and 53b are disposed ahead of and behind the compact supply portion 44, and the central partition plate 53c is disposed rearwardly of the compact discharge portion 45 in the direction of rotation of the hearth 34. Hence, air F.sub.1, which has flowed forward in the direction of rotation of the hearth 34 after the entry of the air F into the furnace through the compact supply portion 44, is blocked by the central partition plate 53a, and its flow into the high temperature space portion S can be suppressed. Air F.sub.2 flowing toward the compact discharge portion 45, on the other hand, is blocked by the central partition plate 53b. Thus, this air can be prevented from contacting direct-reduced iron to be discharged from the compact discharge portion 45, and thereby reoxidizing the direct-reduced iron." (Col.7, line 63 to Col.8, line 11 of

US'471), which teaches that air flow direction is limited and the air should be forced to follow the cooling direction because US'471 teaches that air can be prevented from contacting direct-reduced iron. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to arrange the partition plates as demonstrated in US'471 to control the gas pressure in different portions of the furnace, which includes allowing the flow the furnace gas in the direction of the movement of the hearth (claim 1), maintaining higher pressure in melting step (claim 2); and maintaining higher pressure in the cooling step than the feeding step (claim 15) in order to increase the operation efficiency (Col.8, lines 24-35 of US'471).

Regarding claims 3 and 4, US'471 teaches providing partitions at least between a heating zone, a CO ratio control zone, and reducing atmosphere zone in the high temperature atmosphere space portion (Fig.6, claim 13, and col.10, lines 6-53 of US'471), which reads on the divided zones and partition location as recited in the instant claims 3 and 4. US'471 further teaches the gas in the high temperature space portion flows in the direction of an arrow G (Refer to the figure 6 of US'471) and is discharged through the off-gas duct (Col.7, lines

35-54 of US'471), which reads on the limitation of discharging the furnace gas from the furnace gas outlet as recited in the instant claim 3.

Regarding claims 5, 7, and 8, US'471 teaches air flow controlling partitions (Col.3, line 38 to Col.4. line 33 of US'471) and US'471 teaches moving the partitioning member upward and downward to adjust the height position of the partitioning member in order to adjust the gap between a lower end portion of the partition member and the compacts to an appropriate level. Consequently, flow of air inside the furnace can be suppressed reliably, and damage to the partitioning member can be prevented (Col.4, lines 8-22 of US'471). Although US'471 does not specify at least one of the partitions has one or more vertically movable perforations as recited in claims 5 and 7 and/or by varying the aperture of the one or more perforations as recited in the instant claim 8, the vertical movable partition in US'471, which will lead to the gap changing between a lower end portion of the partition member (Col.4, lines 8-22 of US'471). This gap changing would be a functional equivalent to the claimed varying the aperture of vertically movable perforations in term of air flow-controlling function. Therefore, it would have been obvious to one of ordinary skill in the art at the

time the invention was made to substitute the vertical movable partition with the partition with a vertically movable (claims 5 and 7) and/or variable perforations (claim 8) to control the air flow in the process of US'471, because substitution of equivalents would be within the expected skill in the art with expected success. See MPEP 2144.06. Regarding the step of controlling the flow of the furnace gas in the direction of the movement of the hearth as recited in the instant claims 7 and 8, refer to the rejection for the instant claims 1 and 2, US'471 teaches that air flow direction is limited and the air should be forced to follow the cooling direction because US'471 teaches that air can be prevented from contacting direct-reduced iron. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to arrange the partition plates as demonstrated in US'471 to control the gas pressure in different portions of the furnace, which includes allowing the flow the furnace gas in the direction of the movement of the hearth as recited in the instant claims in order to increase the operation efficiency (Col.8, lines 24-35 of US'471).

Regarding the claim 16, US'471 teaches a process for producing reduced iron in a rotary hearth furnace (Abstract,

col.1, lines 6-12 of US'471) and US'471 teaches using partition plates to regulate the pressure inside the furnace in order to increase the operation efficiency (Col.8, lines 24-35 of US'471). US'471 teaches mixing an iron ore powder, a coal powder, a fluxstone (limestone) powder, and a binder to form reduced iron compacts, which reads on the feedstock containing a carbonaceous reductant and an iron oxide-containing material as recited in the instant claim. US'471 teaches feeding, high temperature atmosphere (in which heating/reducing, melting steps are performed), and discharge portion (in which cooling, and discharging steps are performed) (Col.1, lines 13-23, and Col.2, line 47 to col.3, line 3 of US'471), which reads on all of the major claimed process steps as recited in the instant claims. US'471 teaches air flow controlling partitions (Col.3, line 38 to Col.4. line 33 of US'471), which reads on flow rate-controlling partitions as recited in the instant claim. Refer to the rejection for the instant claims 1 and 2, US'471 teaches that air flow direction is limited and the air flow should be forced to follow the cooling direction because US'471 teaches that air can be prevented from contacting direct-reduced iron. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to arrange the partition plates in the process of US'471 to control the gas

pressure in different portions of the furnace, which includes allowing the flow the furnace gas in the direction of the movement of the hearth as recited in the instant claims in order to increase the operation efficiency (Col.8, lines 24-35 of US'471).

Allowable Subject Matter

Claim 6 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The prior art US'471 does not specify the limitation of "…controlling the flow of the furnace gas to allow the furnace gas to flow in the direction of the movement of the hearth by varying a size of the aperture of the one or more perforations" as recited in the instant claim.

Response to Arguments

Applicant's arguments see "applicant arguments/remarks", filed on 7/30/2010, with respect to objection to the rejections for claims 1-5, 7, 8, 15, and 16 have been fully considered and are not persuasive

Applicant's arguments are summarized as follows:

1, Regarding Kamikawa et al (US'471), the office action has not identified a rational factual basis to support the obviousness in US'471 of the feature of claims 1 and 16, whereby the furnace gas in the cooling step is allowed to flow in the direction of

the movement of the hearth and US'471 does not teach the specific arrangement of the partitions that allows air flow in the direction of the movement of the hearth in the cooling step of the invention.

2, It would not have been obvious for the partition of US'471 to have been arranged to allow the furnace gas to flow in the direction of the movement of the hearth.

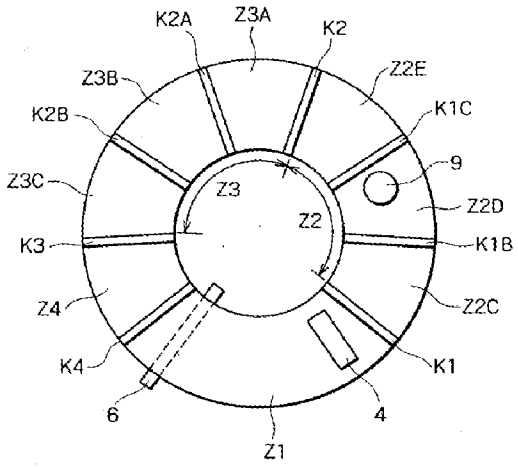
Responses are as follows:

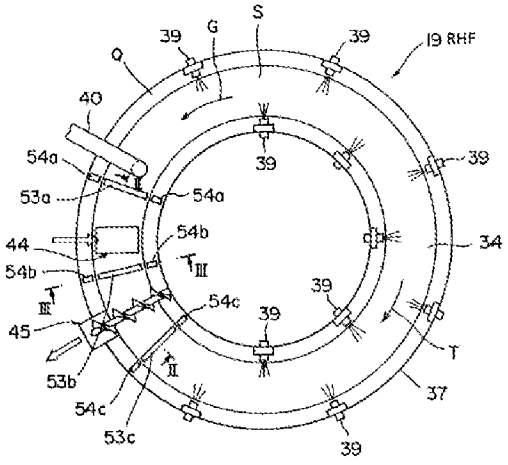
Regarding the argument 1, the Examiner notes that US'471 teaches: "In the present embodiment, however, the central partition plates 53a and 53b are disposed ahead of and behind the compact supply portion 44, and the central partition plate 53c is disposed rearwardly of the compact discharge portion 45 in the direction of rotation of the hearth 34. Hence, air F.sub.1, which has flowed forward in the direction of rotation of the hearth 34 after the entry of the air F into the furnace through the compact supply portion 44, is blocked by the central partition plate 53a, and its flow into the high temperature space portion S can be suppressed. Air F.sub.2 flowing toward the compact discharge portion 45, on the other hand, is blocked by the central partition plate 53b. Thus, this air can be prevented from contacting direct-reduced iron to be discharged from the compact discharge portion 45, and thereby reoxidizing the direct-reduced iron." (Col.7, line 63 to Col.8, line 11 of US'471), which teaches that air flow direction is limited and it should be forced to the cooling direction.

Regarding the argument 2, as shown in the following figures (left is Fig.3 of the instant invention and right is Fig.1 of US'471). They have the similar partition plates

setting (K3 and K4 for the instant invention and 54a and 54b for US'471) in the cooling zone (Z4 of the instant invention and 44 for US'471). As discussed in the response for the argument 1 above, US'471 teaches that air flow direction should be limited to avoid the high temperature zone and it may be forced to follow the cooling direction. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to arrange the partition plates as demonstrated in US'471 to control the gas pressure in different portions of the furnace.

FIG. 3





Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jie Yang whose telephone number is 571-2701884. The examiner can normally be reached on IFP.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King can be reached on 571-2721244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JY

/Jie Yang/
Patent Examiner, Art Unit 1793